MSR® 165

Supplements and Amendments to the MSR 165 User Manual

Open the MSR145 user manual on the enclosed CD and read it through. Then read the supplements set out below.

Page references to the MSR145 user manual are depicted as follows: “-> page”.

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Introduction

The MSR 165 allows high frequency acceleration measurements at max. 1600 HZ (±15%) or high frequency analogue measurements at max. 1024 Hz to be made. High frequency acceleration measurements are used for shock and vibration measurements.
The remaining low frequency measurement parameters are measured at max. 1 Hz and a common measurement rate is automatically used.

Conditional recording of measurement parameters
For high and low frequency measurements, recording conditions can be selected. The measurement parameters are only recorded when the recording condition has been met. The recording conditions are divided into high and low frequency measurements as follows:

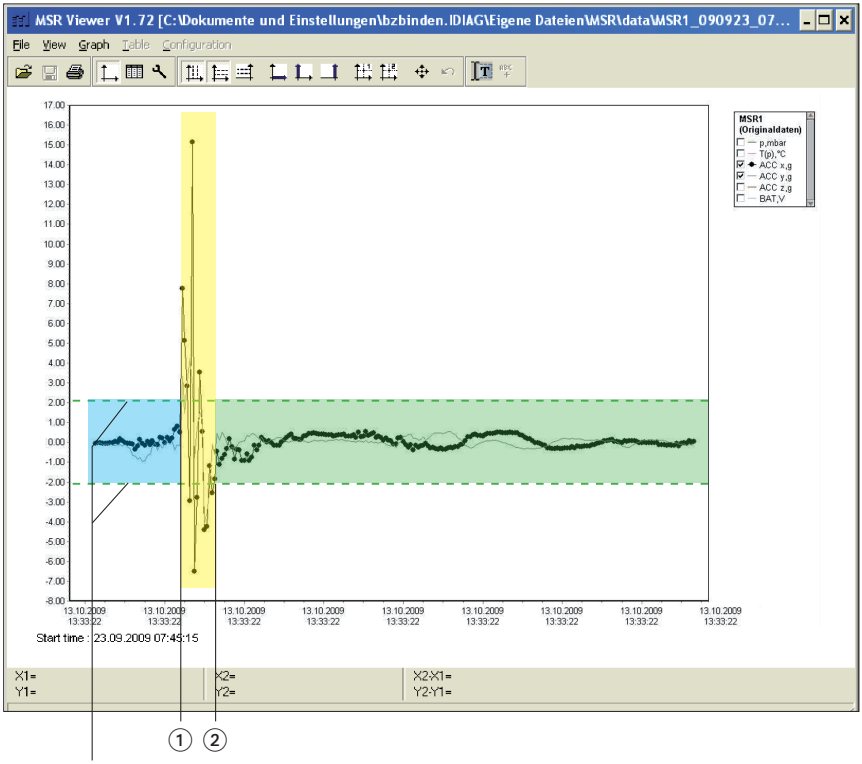
Note: In the case of shock measurements the recording condition is known as the “Threshold” whilst for all other measurements the term “Record limit” is used.

a) Low frequency measurements
When one of the low frequency measurement parameters reaches its recording condition (record limit), the MSR 165 starts to record all of the activated low frequency measurement parameters. It stops recording when the record limit drops below the pre-set value.
The alarm limit can be displayed in Viewer (see also ->26).

b) High frequency measurements
When one of the high frequency measurement parameters reaches its recording condition (threshold, record limit), the MSR 165 starts to record all 3 acceleration axes or all 4 analogue inputs.

In the case of high frequency measurements the MSR 165 also records the last 32 measurement parameters before the threshold value is reached. If the recording condition is no longer fulfilled the MSR 165 still records the next 100 measurement parameters (see figure on next page).

Shock measurement example



Threshold
(Recording condition)

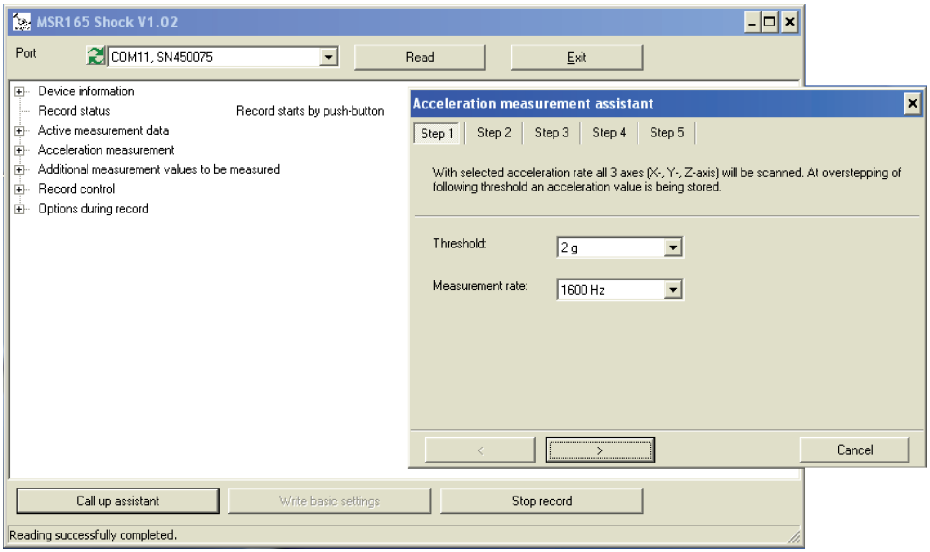
① Recording condition (threshold) fulfilled:
The last 32 measurements are saved.
All subsequent measurement values are saved.

② Recording condition (threshold) no longer fulfilled:
The next 100 measurement values are saved.

Shock measurements

The MSR165 shock measurement function was specially conceived for the monitoring of transportation conditions. Its power consumption when making shock measurements is lower than when measuring vibrations. In addition to registering shocks, temperature, humidity and ambient pressure can also be recorded.

Configuring the MSR165 for shock measurements:
The MSR165 can only be configured for shock measurements using the **Shock** program (msr165_shock).
Open the **Shock** program and click **Open assistant**. Follow the assistant's on-screen instructions. By entering the recording condition (threshold) you can define which shocks are recorded (max. +/- 15g,



Shock program with the assistant open

Note: Measurement of the underlying acceleration due to gravity is not taken into consideration.

Special features for shock measurements

Sensors		Special features	
High frequency measurements	ACC x ACC y ACC z	Measurement rate: 100, 200, 400, 800, 1600 Hz	
		Record limit: All 3 axes have a common threshold value	If a recording condition is fulfilled all 3 axes are recorded (32 measurement parameters before and 100 measurement parameters afterwards)
		Alarm limit: Automatically equal to record limit	Alarm condition fulfilled and status indicator activated (step 4 of assistant): Red LED flashes every 5 seconds until the alarm is cancelled or the recording is stopped. The alarm can only be cancelled if the cancellation function is enabled (step 4 of assistant). As long as a recording condition is fulfilled the alarm output is set to “high”.
		Online	The measurement parameters of the acceleration sensors cannot be displayed during shock measurements.
Low frequency measurements	p T(p) RH T(RH) T A1 A2 A3 A4 L1 (light)	Record limit:	For these sensors no record limit and no alarm limit can be entered.
		Alarm limit:	

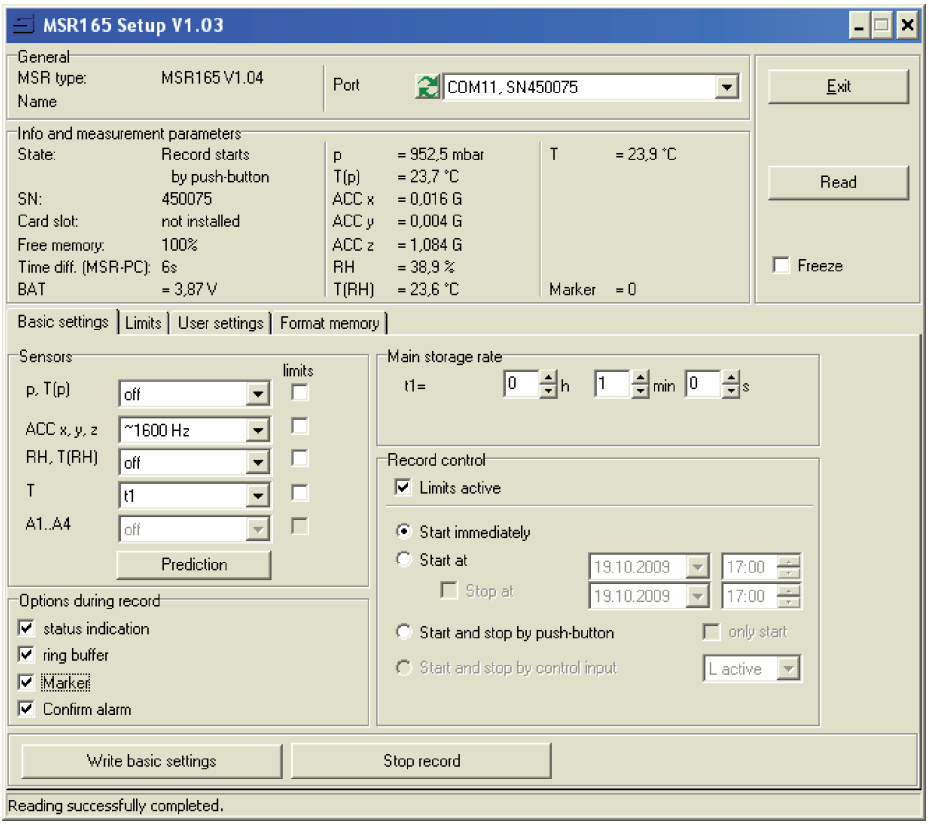
See also **Notes on High frequency measurements**.

Vibration measurements

The MSR 165 has been specially conceived for recording vibrations together with temperature, humidity and ambient pressure.

Configuring the MSR 165 for vibration measurements (->24)**:**

- Start **Setup**.
- Change the basic settings and limits to meet your requirements. A typical measurement rate for vibration measurements is 1600 Hz.
- Transfer the new configuration and the recording start conditions to the MSR 165 by clicking **Write basic settings**.



Typical setup configuration for vibration measurements

Note: Measurement of the underlying acceleration due to gravity is not taken into consideration.

Special features for vibration measurements

Sensors		Special features	
High frequency measurements	ACC x ACC y ACC z	Measurement rate: 25, 50, 100, 200, 400, 800, 1600 Hz	
		Record limit: One record limit can be selected for each axis: <L1 or >L2	If at least one record condition is fulfilled all 3 axes are recorded (32 measurement parameters before and 100 measurement parameters afterwards)
		Alarm limit: Automatically equal to record limit	Alarm condition fulfilled and status indicator activated: Red LED flashes every 5 seconds until the alarm is cancelled or the recording is stopped. The alarm can only be cancelled if this has been enabled ->24, ->26. As long as a recording condition is fulfilled the alarm output is set to “high”.
Low frequency measurements	p T(p) RH T(RH) T A1 A2 A3 A4 L1 (light)	Record limit: <L2 >L2 >L1 and <L2 <L1 or >L2	If at least one recording condition has been reached or all record limits are inactive, all of the low frequency channels will be recorded.
		Alarm limit: <L1 >L1 >L1 and <L2 <L1 or >L2	Alarm condition fulfilled and status indicator “active”. Red LED flashes every 5 seconds until the alarm is cancelled or the recording is stopped The alarm can only be cancelled if this has been enabled ->24, ->26. As long as a recording condition is fulfilled the alarm output is set to “high”.

See also **Notes on high frequency measurements**.

High frequency analogue measurements

With the MSR 165 high frequency analogue inputs (0-3V) including attitude, temperature, humidity and ambient pressure can be recorded.

Configuring the MSR 165 for high frequency analogue measurements (->24):
- Start **Setup**.
- Change the basic settings and limits to meet your requirements.
- Transfer the new configuration and the recording start conditions to the MSR 165 by clicking **Write basic settings**.

Special features for high frequency analogue measurements

Sensors		Special features	
High frequency measurements	A1 A2 A3 A4	Measurement rate: 16, 32, 64, 128, 256, 512, 1024 Hz	
		Recordlimit: One record limit can be selected for each analogue input: <L2 >L2	If at least one record condition is fulfilled all 4 analogue inputs are recorded (32 measurement parameters before and 100 measurement parameters afterwards)
		Alarm limit: Automatically equal to record limit	If an alarm condition is fulfilled the red LED flashes
Low frequency measurements	p T(p) RH T(RH) T ACC x ACC y ACC z L1 (light)	Threshold: <L2 >L2 >L1 and <L2 <L1 or >L2	If at least one record condition is fulfilled or all record limits are inactive, all of the low frequency channels will be recorded.
		Alarm limit: <L1 >L1 >L1 and <L2 <L1 or >L2	Alarm condition fulfilled and status indicator activated. Red LED flashes every 5 seconds until the alarm is cancelled or the recording is stopped The alarm can only be cancelled if this has been enabled ->24, ->26. As long as a recording condition is fulfilled the alarm output is set to “high”.

See also **Notes on high frequency measurements**.

Warning lights on top of the MSR165

The information provided by the warning lights on the top panel of the MSR165 is displayed on two levels (standard indication and status indication).

- The information provided by the **standard display** appears without pressing any buttons or setting any particular defaults.
- The information provided by the **status display** appears at the press of a button or optionally every 5 seconds.

Standard display

Meaning of the yellow warning light when a USB connection is active	
LED	**Meaning**
○ Yellow permanent	Charging in progress
○ Yellow off	Battery fully charged or no connection with PC or PC turned off
☼ Yellow flashes	Akku vollständig geladen Battery fully charged The battery is being briefly charged, e.g. during an online measurement or when data is being saved

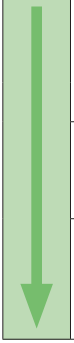
Status display

Activation of the status indicator:

- Manually by briefly pressing the button (see **push-button control** below)
- Automatically every 5 seconds: to do so, activate the **Status display**.

Information displayed		
LED	**Meaning**	**Notes**
○ Yellow	SD card OK	Only if an SD card is inserted.
○ Red	Alarm	Alarm limit reached
○ Blue	Recording in progress ->24	
○ ○ Blue double flashes	MSR165 (standby) ->27	Start time has been transferred to the MSR165 or Record starts by push-button possible or Start via control input

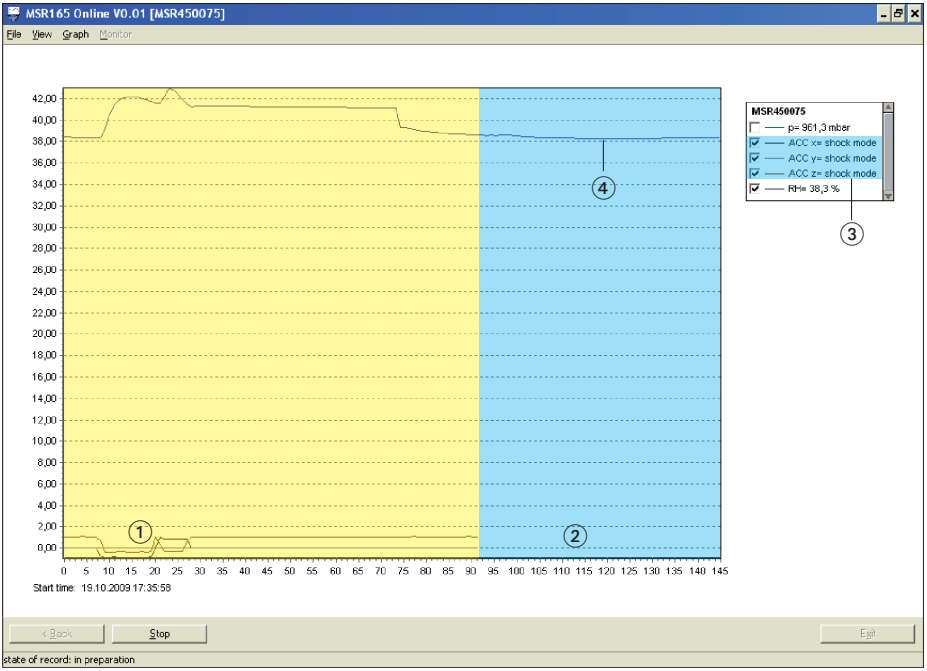
Push-button control

	Duration of button push	Indication / function	Notes
	Short	Status display (see above)	
		Set marker	Only possible if enabled. ->24
	After 2 seconds	Alarm or alarm indicator is cancelled	The alarm can only be cancelled if this has been enabled ->24, ->26.
	After 4 seconds	Starting and stopping data recording	Only possible if **Start and stop by push-button** is activated. ->24

Online

(->40)
Maximum display rate: 1/sec.
Shock measurement: During data recording the measurement parameters from the acceleration sensors cannot be displayed via **Online** (see example).

Example online display of a shock measurement



Online display without recording data
The acceleration values are displayed ①

Online display during data recording
The acceleration values are not displayed ②. The message “Shock mode” ③ appears.
The measurement values for the low frequency measurements are displayed during data recording (in the example, humidity RH) ④.

Notes on high frequency measurements

Circular buffer mode

If circular buffer mode is deactivated and the MSR memory is full, recording will be paused.
In order to avoid this, activate circular buffer mode (see ->24 or Shock assistant step 4).

Reader ->33
During data recording it is not possible to read measurement parameters from the MSR165.

Limitations
Shock measurements, vibration measurements and high frequency analogue measurements cannot be recorded simultaneously. For simultaneous data recording multiple MSR165 units should be used.

Problems and how to solve them

Problem	Solution
The marker function cannot be selected.	Deactivate **Start and stop by push-button**. See ->24 or Shock assistant step 3

Notes on temperature measurements

In addition to pressure, the pressure sensor also records the internal temperature T(p). In addition to humidity the humidity sensor also records the internal temperature T(RH). These internal temperatures are utilised for the temperature compensation of the sensors.

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